THE

CATECHISM OF NATURE.

FOR THE USE OF

CHILDREN.

BY DOCTOR MARTINET,
PROFESSOR OF PHILOSOPHY AT ZUTPHEN.

Translated from the DUTCH.

READ nature—nature IS A FRIEND TO truth.

YOUNG.

BOSTON:
Printed by YOUNG and ETHERIDGE, for
D. WEST, No. 36, Marlborough Street,
and E. LARKIN, jun. No. 50,
Cornhill. MDCCXCIII.

RECOMMENDATIONS.

THE inclosed little book, entitled The Catechism of Nature, *was sent by a friend in London for the amusement and use of my children. I perused it with pleasure, as it appeared to contain much knowledge, conveyed in a stile and manner adapted to the capacity of childhood, and leading the mind to the true end of all knowledge. I think such a book will be more pleasing to every young inquisitive mind, than most of the books that are commonly put into their hands; that it will be a valuable acquisition to Parents, Schoolmasters, and all, whose reason or duty it is to form the first ideas of children—As such I present it, recommending an edition of it to be printed, and not doubting but it will, by a ready sale, reimburse the costs.* *MIERS FISHER.*

October, 1790.

I DO hereby cheerfully certify, that I have read a late work, entitled "The Catechism of Nature, for the use of Children, by Dr. Martinet," with much satisfaction, and it appears to me to be eminently calculated for the purpose intended, of enlarging the ideas and improving the understandings of young people. As it is a judicious, well-designed, moral performance, I hope the several schoolmasters will introduce it into their seminaries of learning.

BENJAMIN SAY.

October 22, 1790.

CATECHISM OF NATURE.

Introductory Dialogue.

Tutor. THE first grand object of your inquiry, my dear pupil, is, God your Creator.

Pupil. How may I acquire a knowledge of my Creator?

Tutor. From his works, and from his word.

Pupil. Has not God revealed himself to us in the bible?

Tutor. Without doubt. But when you can see, as it were, with your own eyes his adorable perfections, it is certainly your duty to view his works, as well as to read his word.

Pupil.

Pupil. Has this been the practice of wise and good men in former ages?

Tutor. Yes; Moses, Job, David, Isaiah and others. Solomon, in particular, we find, spoke of trees and beasts, of fowls, and of creeping things, and of fishes. The Saviour himself also, has directed our attention to the works of nature. "Behold the fowls of the air! consider the lilies of the field, how they grow!"

Pupil. What may I expect from contemplating the works of nature?

Tutor. Both profit and pleasure. As God has formed the eye to behold the beauties of nature, it must be both agreeable and useful.

Pupil. Is not this a pleasure confined to the learned?

Tutor. By no means; the peasant, as well as the philosopher, may partake of this pleasure. A moderate share of knowledge is sufficient. The creation is open to the view of all; it only requires observation.

Pupil.

Pupil. What may I expect to find in the works of God?

Tutor. Whatever is wise, great, good, and perfect. God beheld every thing that he had made, and saw that it was good.

Pupil. And do they continue so?

Tutor. All, to this day, answer the designs of the Creator, if we except the change which the fall occasioned.

DIALOGUE I.—PART I.

ON THE FIRMAMENT, AND THE HEAVENLY BODIES.

Pupil. WHICH of the works of God should first engage my attention?

Tutor. If you would first view the greatest of God's works, you must turn your eyes up to the firmament, that wide boundless space, in which are fixed the earth, the sun, the moon, the planets, the comets, and the stars.

Pupil. What are the principal qualities of the firmament? *Tutor.*

Tutor. Extent and tranſparancy. It muſt be very extenſive, to contain the innumerable heavenly lights; and tranſparent, otherwiſe we could not ſee them. Its extent cannot be computed; and the tranſparency of the firmament is equally amazing.

Pupil. What ſtars are thoſe which we ſee in a clear evening?

Tutor. They are great bodies of fire, like our ſun; but on account of their immenſe diſtance, appear ſo very ſmall.

Pupil. How many ſtars are there in the firmament?

Tutor. The number we ſee with the naked eye is not conſiderable; but, as the better our glaſſes are, the more we ſee—to ſpeak in the language of men, "they are innumerable."

Pupil. Why do they twinkle?

Tutor. That appearance is occaſioned by intervening vapours floating in the air.

Pupil. The ſtars appear to be placed without any order.

Tutor.

Tutor. They appear so, because we see them but in one point of view; but they are certainly arranged in the most exact and beautiful order; for they were arranged by God, who is order and beauty itself.

Pupil. Did God create the stars only for our use?

Tutor. It is unreasonable to suppose it, on account of their vast distance; but they were probably created to enlighten other worlds, as the sun enlightens ours.

Pupil. Are the stars then suns like ours?

Tutor. Yes, such is the common prevailing opinion of philosophers.

Pupil. Are they in no degree serviceable to us?

Tutor. They serve to enlarge our ideas of the works of God, to diminish the gloom of darkness; they are of service also to mariners; that one particularly so, which is called the north pole-star, which always has one and the same position in the heavens.

Pupil.

Pupil. But let us ſpeak of our own ſun, if you pleaſe, Sir, and of our own ſyſtem. How large is the ſun?

Tutor. Ten hundred thouſand times larger than our earth.

Pupil. How far, do you ſuppoſe the ſun to be from the earth?

Tutor. Ninety-five millions, one hundred, and ſeventy-three thouſand Engliſh miles.

Pupil. What an amazing diſtance! Would it not be better, if the ſun was nearer us?

Tutor. Our all-wiſe Creator could not miſtake. He has exactly adjuſted its proper place; if it was nearer, we ſhould be burnt; if farther off, we ſhould periſh with cold.

Pupil. What benefit do we receive from the ſun, beſide its affording us light?

Tutor. By its warmth and heat it promotes vegetation, cheriſhes animal life, and raiſes the vapours from the ſea, without which we ſhould have no rain.

Pupil.

Pupil. Of what nature, or quality is light ?

Tutor. It is an emanation of rays from the ſun, ſpreading themſelves with inconceivable velocity through the ether. Light is exceedingly fine and ſubtle; it penetrates through glaſs, and is diffuſed over the whole world.

Pupil. How does it appear that the rays of the ſun partake of the nature of fire ?

Tutor. It appears from hence, that, when collected in a burning glaſs, they produce ſimilar effects, and will ſet things on fire.

Pupil. Is there any thing more particular in theſe rays ?

Tutor. They are the cauſe of all the different colours we ſee, of the morning and evening twilight, and of the light coming into our houſes.

Pupil. What am I to underſtand by the morning or evening twilight ?

Tutor. The gradual ſlow increaſe and decreaſe of the ſun's light; without

out which we ſhould paſs inſtantly out of dark night into clear day, and the light would as ſuddenly leave us.

Pupil. Would that be prejudicial?

Tutor. The eye could not bear ſuch a ſudden tranſition as the former, and the latter would often perplex and diſtreſs us: Againſt both theſe inconveniences God has wiſely provided, by this twilight.

Pupil. How, or by what means does the light enter our houſes?

Tutor. By the wonderful property of refraction, or bending of its rays out of their right line; which means our rooms are enlightened.

DIALOGUE I.—PART II.

Pupil. ARE there not other lights in the firmament?

Tutor. Yes; but they ſhine only with borrowed light, and are called planets.

Pupil.

Pupil. What are the names of thoſe planets ?

Tutor. That which is neareſt the ſun, we call Mercury ; the next Venus, then our Eearth, with is moon ; ſtill farther from it, are Mars, Jupiter, and Saturn, with their moons, which are all enlightened by the ſun.

Pupil. Has not a new planet been lately diſcovered ?

Tutor. Yes, by his Britannic Majeſty's aſtronomer, Mr. Herſchel ; who has called it in honour of his royal patron, Georgium Sidus.

Pupil. Our earth has a moon ; have the other planets moons too ?

Tutor. Jupiter has four, Saturn five, and Georgium Sidus two, as lately diſcovered by Mr. Herſchel's new invented teleſcope. Some have thought that Venus has a moon, as Fontanna, and Caſſini ; and Short, in the year 1740, ſaw an illuminated ſpeck near this planet, which he ſuppoſed to be its moon. Three French aſtronomers

ſaw

ſaw the ſame in the year 1761 and 1765.

Pupil. How are thoſe planets to be diſtinguiſhed from the ſtars?

Tutor. The ſtars twinkle; the planets ſhine with a ſteady light. The planets, alſo, are continually changing their poſitions in the heavens; but the ſtars keep their reſpective places, and are therefore called the fixed ſtars.

Pupil. In what manner do the planets move?

Tutor. They all move round the ſun; but not in the ſame orbit, nor in the ſame time.

Pupil. In what time does the earth revolve round the ſun?

Tutor. In three hundred and ſixty-five days, which makes our year; and though it revolves with incredible ſwiftneſs, we are yet inſenſible of its motion.

Pupil. Why are we not ſenſible of its motion?

Tutor.

Tutor. Becauſe the air, which encircles the earth (which we call the atmoſphere) is carried along with it; and all ſurrounding objects move with us at the ſame time.

Pupil. Why is it not always equally warm?

Tutor. The inclination of the earth's axis, as it moves round the ſun, is the occaſion of the various ſeaſons; Spring, Summer, Autumn, and Winter. This I ſhall explain to you in my future lecture on aſtronomy.

Pupil. Has the earth any other motion?

Tutor. Beſide that round the ſun, which we call its annual revolution, it has another motion round its own axis, once in twenty-four hours, which makes our day and night, this we call its diurnal revolution.

Pupil. Does the moon move round the earth?

Tutor. Yes, in twenty-four days, and continually attends upon the earth,

during its whole revolution round the ſun.

Pupil. Why do we not always ſee the moon?

Tutor. When it is on that ſide of the earth next the ſun, then the dark ſide of the moon is towards us, for which reaſon we are not able to ſee it.

Pupil. What am I to underſtand by an eclipſe?

Tutor. When the moon's ſhadow falls upon the earth, we call that an eclipſe of the ſun, becauſe the moon prevents our ſeeing the ſun, more or leſs, according to the extent of its ſhade. And when the ſhadow of the earth falls upon the moon, we call that an eclipſe of the moon. Obſerve, an eclipſe of the moon can only happen when it is full moon, and an eclipſe of the ſun when it is new moon.

Pupil. As the moon, you ſay, is a dark body of itſelf, do we receive any benefit from it?

Tutor. Yes, from its reflecting to our earth, the ſun's light; which is ſo

ſo particularly pleaſing and uſeful during the long dark nights of winter. What a ſingular mark of the divine goodneſs, thus to provide for us in the abſence of the ſun?

Pupil. Have we any other advantage from the moon?

Tutor. Yes, it is, together with the ſun, the cauſe of the ebbing and flowing of the ſea, which tends to purify it; and the tides are very uſeful for navigation.

Pupil. Is the moon inhabited?

Tutor. Some philoſophers ſuppoſe it is; and that our earth ſerves as a moon to them. For you may ſee plainly yourſelf, that our earth reflects the ſun's light on that ſide which is not illuminated; this you may perceive every new moon; but more in the winter than the ſummer months.

Pupil. Do you alſo ſuppoſe then, the planets of other ſyſtems, to which the ſtars are ſuns, are inhabited?

Tutor.

Tutor. Without doubt. Such an idea is truly philoſophical, grounded upon reaſon and analogy. As there is ſuch an amazing variety and gradation in the animal ſpecies, ſo it is not to be ſuppoſed that angels and men are the only intelligent beings in the univerſe.

Pupil. But might we not expect the bible to have given us ſome light upon this ſubject?

Tutor. The bible was not deſigned to teach us aſtronomy, geometry, or mathematics. It gives us a minute relation of the formation of our own ſyſtem—and that the other parts of the univerſe are innumerable. Philoſophical reſearches ſoar above the level of common underſtandings. Moral truth is of more intrinſic value, and an humble, obedient heart, worth all the ſtores of human learning. But we are loſing ſight of our ſubject. What queſtion do you next deſign to aſk me?

Pupil.

Pupil. What idea am I to form of the comets?—Are they bodies of fire?

Tutor. No. They receive their light from the ſun; which is apparent from their ſhining train.

Pupil. Is not that train, or tail, fire?

Tutor. It is conjectured to be only its atmoſphere, enlightened by the ſun.

Pupil. Are not the comets ſuppoſed to paſs far beyond the limits of our ſyſtem?

Tutor. Yes; which ſerves to give us a very enlarged idea of the extent of the firmament. The period of that comet's revolution, which appeared in 1759, was computed at about ſeventy years; and that which was ſeen in 1680, has been ſhewn to have a period of more than five hundred years. The orbits of more than fifty comets have been fixed with ſufficient accuracy to aſcertain when they may be expected to appear again.

Pupil. Are the comets ſuppoſed to be inhabited?

Tutor. All that we can ſay is conjecture: If they are inhabited, the beings who live there muſt be very different from thoſe we have been converſant with. Some are of opinion, they are only intended as a ſupply for that diminution which the ſun muſt ſuffer by the unceaſing emiſſion of its particles of light and heat.

Pupil. Do theſe comets prognoſticate evil?

Tutor. Many people are frightened at their appearance, as if they portended ſome public national calamity; but without foundation: For peace, plenty and proſperity, have followed their appearance—as well as war, peſtilence, or famine. "Be not diſmayed," ſaith the Lord, by his prophet Jeremiah, "at the ſigns of the heavens; for the heathen," the ignorant, "are diſmayed at them."

DIALOUGE

DIALOGUE II.

ON THE AIR, WIND, RAIN, &c.

Pupil. I OFTEN hear of the air—What idea am I to form of an element that is inviſible ?

Tutor. It is a fluid which agitates bodies when it is in motion. In a word, it has the properties of rarity, tranſparency, and elaſticity ; and when compreſſed, has an amazing power, ſimilar to the expanſion of gun powder.

Pupil. Has the air any more peculiar properties ?

Tutor. It conveys ſound, and is neceſſary to give us the ſenſe of hearing. Without air, we ſhould have no muſic, no ſmell, no light, nor be able to converſe with each other.

Pupil. What is wind ?

Tutor. The wind is nothing more than a part of the air, put into motion leſs or more,

Pupil.

Pupil. From what cauſe does this ariſe?

Tutor. Principally from warmth or cold which is excited in the air. Heat expands the air, and cold condenſes it.

Pupil. Have you any particular names, by which to diſtinguiſh the winds?

Tutor. According to the quarters from which they blow; Eaſt, Weſt, North, and South.

Pupil. Will you pleaſe to tell me how to find thoſe quarters?

Tutor. If, at noon, you ſtand with your back to the ſun, the eaſt is on your right hand, the weſt on your left, the north directly before you, and behind you, the ſouth; or, at night, if you ſtand with your face to the pole ſtar, the eaſt is ſtill on your right hand, the weſt on your left, and north and ſouth, as juſt now mentioned.

Pupil. Of what uſe are the winds?

Tutor.

Tutor. The benefits arising from the winds are almoſt innumerable: They purify the air, moderate the heat, dry wet lands and damp houſes, chaſe away the fogs and hazy weather, and bring us the rain in due ſeaſon; alſo, froſt and ſnow, and milder weather. They are particularly ſerviceable for navigation and commerce.

Pupil. What are vapours or clouds?

Tutor. Vapours are either thin, inviſible, moiſt particles, which float in the air; or, being more condenſed, and by that means rendered viſible, are called clouds. This work of the Creator was obſerved of old—"He bindeth up the waters in his thick clouds, and the cloud is not rent under them."

Pupil. From whence do the vapours ariſe?

Tutor. They are drawn up, by heat, out of the earth, and by their lightneſs hang in the air.

Pupil. Of what uſe are theſe vapours hanging in the air? *Tutor.*

Tutor. They cool the air, when it is too hot; afford us agreeable ſhades, when formed into clouds; prevent the earth from becoming too dry, and water it with refreſhing rain.

Pupil. What is the natural cauſe of rain?

Tutor. When the air is ſo full of heavy vapours, that it can no longer ſuſtain them, then theſe ſmall moiſt particles, adhering together, fall down in fine drops, which we call rain—which heat, cold, and wind, contribute to produce. And the rain falling in drops, is a further manifeſtation of divine wiſdom; for, if it fell in ſtrong ſtreams, it would injure the earth, by waſhing away its fine light mould from the roots and ſeeds, and we ſhould ſuffer great inconvenience from it.

Pupil. What brings the rain?

Tutor. The winds, which, at God's command, convey the clouds over the whole earth.

Pupil.

Pupil. What benefit do we derive from the rain ?

Tutor. It makes the earth fruitful, it refreſhes the withering plants, it cools the air in ſummer, it ſupplies our ſprings, and forms our rivers, ſo that we are never in want of water.

Pupil. Are there any ſigns or tokens of approaching rain ?

Tutor. Many ; we can forſee its approach by the wind, by birds, plants, &c.

Pupil. How comes the cold or froſt ?

Tutor. Generally by the wind which blows from the north-weſt ; and the ſtronger the wind, the ſeverer the froſt.

Pupil. How is the ice formed ?

Tutor. By an extraordinary degree of cold, which congeals the water into a firm ſubſtance.

Pupil. Of what uſe is froſt ?

Tutor. God has wiſe deſigns in all his operations ; and the froſt is not without its uſe : It clears the atmoſphere,

phere, braces and ſtrengthens the human frame, mellows the clay ground, and fertilizes it, deſtroys hurtful inſects, and ſerves other uſeful purpoſes.

Pupil. What is ſnow? And of what uſe?

Tutor. It is nothing but water in another form; white and light, and falls in the moſt beautiful figures; which every perſon may ſee, who will but view the flakes of ſnow attentively. As to its uſe; it preſerves the corn from being chilled by the froſt; therefore, ſaid David, that pious contemplator of nature, "He giveth ſnow like wool;" it hinders the froſt from penetrating too deep into the earth. Snow is alſo a manure to the earth, from the nitrous particles it contains; and by its colour diminiſhes the darkneſs of our long winter nights.

Pupil. What is hail?

Tutor. Nothing more than drops of rain congealed by greater degrees of cold.

Pupil.

Pupil. Are not mists and dews wholly useless?

Tutor. By no means; they refresh and invigorate weak and withering plants, in time of scarcity of rain.

Pupil. How do they arise?

Tutor. They are vapours arising from the earth, condensed by colder air, and thus become visible.

Pupil. What is hoar frost?

Tutor. It is, like hail, only vapours congealed, and wisely ordained for the preservation of trees and herbs. The hoar frost is scattered like ashes. This also, as well as the snow, falls in very beautiful forms, which are well worth minute inspection.

Pupil. What idea am I to form of thunder and lightning?

Tutor. Lightning is occasioned by the electric matter in the clouds, discharging itself sometimes from one cloud into another—sometimes from the clouds into the earth—and at other times, from the earth into the

clouds, accompanied with that awful roll, or ſound, which we call thunder.

Pupil. Is thunder, indeed, nothing more than ſound?—Then I need not be afraid of what we call thunder-bolts?

Tutor. That is only a vulgar miſtaken idea. All the danger ariſes from lightning—and even that is not dangerous when at a diſtance.

Pupil. How am I to judge of its diſtance?

Tutor. By the interval between the flaſh and the ſtroke. If that interval is conſiderable, it is diſtant, and then not dangerous—but when the ſtroke almoſt inſtantly ſucceeds the flaſh, it is then near, and conſequently the danger the greater.

Pupil. Have you not told me it is dangerous to go under trees when it lightens?

Tutor. Yes, becauſe trees very much attract the lightning. It is better to continue in the open field or public

public road (if no houſe is near) than to take ſhelter under trees.

Pupil. Is lightning of any uſe?

Tutor. More ſo than many are aware of. It conſumes noxious vapours—it promotes a circulation of the air—it brings on rain at a time when it is often moſt wanted, and cools the heat of ſummer. "Fire and hail, ſnow and vapour fulfil his word."

Pupil. I thank you, I ſhall not be afraid of the lightning, as I uſed to be; but what occaſions the beautiful rainbow?

Tutor. The rainbow, with its beautiful colours, is occaſioned by the rays of the ſun ſhining upon the falling drops.

DIALOGUE

DIALOGUE III.

ON THE EARTH.

Pupil. FOR what purpoſe was the earth created ?

Tutor. God formed the earth to be inhabited, and millions of living creatures are in every part of it.

Pupil. On what do you ſuppoſe the earth to ſtand ?

Tutor. It ſtands not upon any thing —if it did, how could it move ? Hear the poetical language of Job : " He hangeth the earth upon nothing."

Pupil. Does this globe, then, which we inhabit, continually hang and move in the air ?

Tutor. Certainly it does, as well as the other planets.

Pupil. What an amazing power muſt it be which fixed them, which firſt ſet them in motion, and which ſtill keeps them there !

Tutor. God made the earth by his power—he eſtabliſhed the world by his

his wiſdom—and ſtretched out the heavens. "On what," ſaith the earth's Creator, "are the foundations thereof faſtened? Or who laid the corner-ſtone thereof? When the morning ſtars ſang together, and all the ſons of God ſhouted for joy."

Pupil. Of what are thoſe material things chiefly compoſed?

Tutor. Of earth, air, fire and water.

Pupil. What does the earth conſiſt of?

Tutor. It conſiſts of fine mould, ſtone, clay, ſand, minerals, metals, foſſils, &c. which have each their reſpective well-known uſes. But they are, moſt of them, hid from our ſight, by the green plants and herbs.

Pupil. Why is the firmament blue, and the produce of the earth green?

Tutor. In this appears the divine care for our welfare. Theſe two ſoft, pleaſing colours, are agreeable to the eye; and neither weary nor injure the ſight, as ſome other colours do.

Pupil. How many ſorts of metals are there?

Tutor. Six; gold, ſilver, copper, tin, lead, and iron.

Pupil. Why are all theſe under the ſurface of the earth?

Tutor. If they were above, or upon the ſurface, they would occupy the beſt part of the earth, and prevent our cultivating it. As they now lie in ſubterraneous magazines, they are no hinderance to agriculture.

Pupil. Which is the moſt uſeful of theſe metals?

Tutor. Iron. Gold may purchaſe iron, but it will not ſerve as a ſubſtitute for it, becauſe it is not a metal equally hard. Gold would not ſerve for our ploughs or anchors. In a word, not one thing you have about you is made without the aſſiſtance of iron.

Pupil. What other valuable things are to be found in the earth's grand magazine?

Tutor.

Tutor. That valuable fuel for fire, coals, without which, in many parts of the world, they could neither dress their victuals, nor comfortably pass their winter evenings, and which mechanics also find so very useful.

Pupil. When such a vast quantity of this fuel is consumed every day, how great must be the store, which our kind Creator has made for our use!

Tutor. Inconceivable! consuming every hour, night as well as day, and yet these treasures not exhausted.

Pupil. Are the metals you have mentioned equally plenty in all countries?

Tutor. No. If every country produced exactly the same things, there would be no commerce, no intercourse, between distant nations.

Pupil. Are there any other valuable things to be found in the earth's store-house?

Tutor. Quick-silver, brimstone, limestone,

limeſtone, chalk, ſalt, clay for bricks, pipes, and what is uſually called earthern ware.—Marble, ſtone, chryſtals, diamonds and magnets, or load-ſtones, which are ſo peculiarly ſerviceable to navigation.

Pupil. What a rich treaſure the earth contains below its ſurface; and all for the uſe of man!

Tutor. Rich indeed! How thankful ought we to be to our bountiful Creator, who has provided ſo many good things, and in ſuch great variety, for our uſe and pleaſure.

DIALOGUE IV.—PART I.

ON MAN.

Pupil. WHICH am I to conſider as the nobleſt work of God?

Tutor. Intelligent beings, ſuch as angels and men. I ſhall now ſpeak only of the latter. Though man is inferiour to angels, he is the nobleſt creature

creature on this earth. For God made him the lord of this lower world, and put all things under his feet. He exceeds other creatures in beauty of form, of limbs, and of countenance; in ſpeech, in his erect poſture, and as having a rational ſoul. For God taught man more than the beaſts of the earth, and made him wiſer than the fowls of heaven.

Pupil. Will you be ſo kind as to give me ſome information concerning the human body?

Tutor. The moſt ſtriking part of the human body is the face, and one peculiar proof of divine wiſdom is, that every human face ſhould be ſo readily diſtinguiſhed from another, elſe the innocent might ſometimes ſuffer for the guilty.

Pupil. This I never before attended to. Pray, why is the head formed of a harder ſubſtance than the reſt of the body?

Tutor. That ſo tender a part as the brain

brain (the ſeat of reaſon) may be ſecurely preſerved.

Pupil. Is the hair of the head merely ornamental?

Tutor. No. It not only keeps the head warm, but it ſerves to keep open the pores, to let out the evaporations through their own hollow tubes, and ſerves alſo for its defence from violence.

Pupil. Are the hairs hollow?

Tutor. Yes, this you may ſee with the microſcope.

Pupil. What have you to tell me of the eye?

Tutor. It is one of the moſt artfully conſtructed parts of the human body. Leaving the internal conſtruction of the eye to the anatomiſt, I ſhall now only make the following remarks.—That the eye is moveable in its ſocket, that we may be able to ſee on every ſide without moving the head—That by its poſition it is well ſecured from injury—That when we have

ſound or wholeſome before it enters the mouth. The noſtrils, wiſely adapted to this end, are rather broad below to receive the ſmell. Through theſe alſo paſs the ſharp humours of the head; and when, during the time of our eating, we cannot breathe with our mouth, we can breathe through the noſtrils.

Pupil. What is there obſervable concerning the taſte and the ſenſe of feeling?

Tutor. It enables us to judge of good or bad food, and affords us much pleaſure. Owing to this it is, that hunger ceaſes as ſoon as we have eat enough. If it was not ſo, we ſhould often eat more than is good for us. The ſenſe of feeling is ſpread over the whole body, whereas the other ſenſes have their reſidence in the head.

Pupil. Where are the ſenſes the ſtrongeſt?

Tutor. Where they are moſt wanted. For inſtance, on the tip of the

tongue, the lips, the ends of the fingers, the hands, &c. Our ſenſes are ſet as faithful guardians for our preſervation; and when we loſe one ſenſe, we often find that another grows the ſtronger; as in blind people, it is obſerved that the hearing becomes more acute.

Pupil. What merits our farther attention in the head?

Tutor. The tongue, that wonderful inſtrument of ſpeech, from which ariſes ſo great a part of our earthly happineſs. It is alſo well adapted to aſſiſt the chewing of our food, to mix it with the ſaliva, ſo neceſſary for digeſtion, and to help it in the paſſage to the throat, and without the tongue we could have no vocal muſic.

Pupil. The uſe of the teeth I need not aſk you; but what prevents them from wearing away by ſuch inceſſant labour?

Tutor. A fine enamel, with which they are covered. For when this wears

wears off, the teeth decay, and hence arises the common complaint, the tooth-ach. But, beside their use in chewing, you may not perhaps have observed that they contribute to the formation of our speech; for they who lose many of their teeth, are not so easily understood. The lips also serve for the same purpose; hence some of our letters are called labials. Beside this, with the lips we receive and taste our food. But suppose we here pause a little, lest I weary your mind.

Pupil. I am not weary; but I submit to your pleasure.

DIALOGUE IV.—PART II.

ON THE HUMAN BODY.

Tutor. WE now proceed to the throat. In this is an open tube, which we call the wind-pipe, through which we breathe. Behind this is another called the gullet, through which the food passes into the stomach.

Pupil.

Pupil. Muſt not then our food paſs over the open wind-pipe, and conſequently be in danger of falling in ?

Tutor. So you might well think. But God has provided againſt this. Behind the root of the tongue we find a muſcular membrane,* which cloſes the wind-pipe whenever we attempt to ſwallow any thing, over which the food paſſes, as if it went acroſs a bridge.

Pupil. A crum of bread gives us pain in the throat ſometimes ; from whence does that ariſe ?

Tutor. From its falling into the wind-pipe (or as we commonly ſay, going the wrong way), but this does not happen often, unleſs we laugh or talk while we have our mouth full of food. Great wiſdom is alſo diſcernable in the ſtructure of the neck. It is formed with ſo many joints that we, can eaſily turn the head without moving the whole body : And it is provided with ſtiff bones to keep the head

* *Called the Epiglottis.*

head upright, without which man would lose much of his grace and dignity.

We now descend from the head and neck to the body. The larger bones may be considered as the great pillars of a building :—The muscles or the fleshly parts, as so many cords, to bring every thing into motion :—The arteries and veins, as the streams of refreshment and the springs of life.

The heart, in the middle, as the fountain or working machine, conveys the blood, by means of the arteries, to the extremities, which is returned back by the veins ; and the continual pulsation of the heart keeps up the perpetual circulation of the blood. The lungs are instruments to admit good air to cool and refresh the blood, and to let the air out, when it has performed its office. The stomach is a great laboratory, where every thing is prepared that can serve to the necessary recruiting of the whole bo-

dy. The arms, hands and fingers, may be conſidered as the guardians of the body, the houſe, and alſo to labour in the various duties of life; the fingers are therefore formed with ſmall bones and ſtrong muſcles, to move with the greater eaſe.

Pupil. Is not the right hand formed with more, or ſtronger, muſcles than the left?

Tutor. That we can do more with the right hand, is only owing to habit, becauſe we have been accuſtomed from our infancy to uſe that more than the left.

Pupil. Have you any thing more particular to obſerve here?

Tutor. It is worth attention to remark, that the ſkin of the hand becomes thicker, that it may not be worn out by working, and yet does not entirely loſe its feeling. The ſame may be obſerved of the ſoles of the feet. The poſition of the thumb, alſo gives additional ſtrength to the fingers,

fingers, by enabling them to keep firmer hold of any thing. And further, you may alſo conſider, what works of art, ſuch as writing, drawing, painting, and inſtrumental muſic, are performed by theſe five ſmall members of the human body. And to crown and perfect the human fabric, the whole body is covered with a fine ſkin, as a curiouſly wrought upper garment without a ſeam; through which are an infinite number of inviſible ſpiracles, or, apertures, which, we call pores.

Pupil. Of what particular uſe are theſe pores.

Tutor. Through theſe evaporate the ſuperfluous moiſture of the body, which we uſually term perſpiration; the regularity of which is ſo neceſſary for the health of the body, that when perſpiration is ſtopped, it throws the body into uncommon heat, which we term a fever, and which is ſo often fatal. Exerciſe and cleanlineſs are the beſt promoters of this neceſſary perſpiration.

DIAL.

DIALOGUE IV.—PART III.

OF THE INTERNAL PART OF THE HUMAN BODY.

Pupil. I SHOULD now be glad, if you would give me a clear idea of those parts of the body which are not visible to the eye; I mean its internal parts.

Tutor. The principal internal parts are; first the stomach, a wide paunch in which the food (that has been chewed in the mouth) is dissolved. To facilitate the dissolution of which, it receives, in its progress, a liquor from the gall-bladder. The next thing observable is, the bowels, which receive the food from the stomach, push forward the softer parts, and absorb all the fine juices, by means of numerous absorbent vessels called lacteals, which are placed in the bowels, and are of curious construction.—The bowels are near thirty feet long, but, by their various foldings, take up but a small compass.

Pupil. What becomes of the grosser parts of our food? *Tutor.*

Tutor. When all the nouriſhment is drawn from it, thoſe groſſer parts paſs onward, to be diſcharged from the body.

Pupil. And how, or in what manner, is the body nouriſhed by food?

Tutor. The fine juices (called chyle) are conveyed by means of the myſentery, to the heart, to be formed into blood.

Pupil. How is all this work effected?

Tutor. The heart receives theſe juices, and injects them into the lungs, and the lungs preſs and prepare them. The air, drawn in by the lungs, paſſing through the windpipe, expels the inflammable parts in the act of breathing, and the lungs return the juices back to the heart, and they are thus converted into good blood, which nouriſhes the whole body.

Pupil. What gives the blood its motion or circulation?

Tutor.

Tutor. In that lies the grand ſecret, termed Life. Our Creator has given to the heart a power of opening and of cloſing its cavities, which we call its expanſion or contraction—and as long as this continues, we live. By the former, the blood is brought in, and by the latter, ſent forcibly out into a duct, called the great artery. It is ſuppoſed the pulſations of the heart are more than two thouſand every hour, whether we wake or ſleep.

Pupil. I am loſt in wonder and admiration!

Tutor. Adopt the words of the pſalmiſt, who was much employed in meditating on the works of God—"I will praiſe thee, for I am fearfully and wonderfully made. Marvellous are thy works, and that my ſoul knoweth right well." But I have one thing more to call your attention to, which will alſo excite your aſtoniſhment. It is this, if the blood

(which

(which is brought again to the heart, into its other cavity, from the extremities of the feet through the veins) was ever to flow back, we should die; so God hath provided against such an accident, by placing, in the veins small sluices, or valves, which permit the blood to pass forward, but effectually prevent its return.

Pupil. David might indeed well say, that we are "fearfully and wonderfully made."

DIALOGUE IV.—PART IV.

OF THE HUMAN SOUL.

Tutor. HAVING spoken so largely of the body, I shall now proceed to give you some account of the soul. This is far superior, in excellence and dignity, to the body, on account of its spiritual nature, its intellectual and moral powers, and its immortal duration.

Pupil. What are those powers?

Tutor.

Tutor. They consist in forming ideas, thinking, reasoning, judging, and willing. And it possesses, besides, the powers of memory and imagination.

Pupil. Has the soul any passions?

Tutor. Yes; such as joy, love, desire, hope—and a sense of honour. It feels pity and compassion. It has also the passions of fear, shame, grief, anger, &c.

Pupil. Are these passions beneficial to us!

Tutor. Without doubt, when under proper regulation, they were designed by our all-wise Creator to excite us to moral and pious actions. But if these passions are not under proper discipline, they may lead us to much evil, and expose us to great injury. "He that hath no rule over his own spirit, is like a city broken "down, and without walls."

Pupil. Is it known how the soul is united to the body?

Tutor.

Tutor. That surpasses the conception of the wisest philosophers.

Pupil. But must not man die, though such a noble creature ?—What a pity, that so beautiful a fabric should crumble to dust !

Tutor. Every day's experience proves our mortality ; but the gospel gives us the strongest assurance that good men will be raised again, with more perfect bodies, and placed in a state of happiness that will never end.

Pupil. As men are dying perpetually, is there not some danger of the world's losing all its inhabitants ?

Tutor. Though, from calculations which have been made, sixty are supposed to die every minute, yet more than sixty are supposed also to be born every minute. And for every hundred females born into the world, there are born one hundred and five males, as more of the latter are supposed to die in earlier years than the former, and many by wars.

Pupil. Do more men die in the

country, than in very populous cities?

Tutor. More in cities; becauſe there the air has not that free circulation it has in the open country, conſequently it is not ſo pure for breathing: Beſides, infectious diſorders more eaſily ſpread their baneful influence, and are more readily communicated, when habitations are ſo contiguous to each other, and the ſtreets and lanes are narrow, and crowded with inhabitants. But, wherever we live, whether in town or country, we breathe God's air, we enjoy his light, we live upon the produce of his earth—in ſhort, all that we have is the Lord's. It muſt, therefore, be manifeſtly our duty to ſerve him, both with our bodies and our ſpirits, which proceed from him.

DIALOUGE V.

ON LAND AND WATER.

Pupil. WOULD not the earth be more beautiful if it was one ſmooth extended plain, without hills and mountains? Do not the mountains disfigure it?

Tutor.

Tutor. By no means. Do you think the duſt that falls upon the Geographical Globes disfigures them? The mountains are no greater, in compariſon with the whole earth, than the duſt to the globes: or the roughneſs of an orange. Without mountains, we ſhould have no ſprings nor rivers: they receive the vapours, the rain, and the ſnow, which ſupply the ſprings with water. Mountains are the grand magazines of metals, minerals, marble, ſtone, &c. and, beſides attracting the clouds, they ſhelter the low lands and vallies from the bleak and cold winds.

Pupil. What is the uſe of thoſe ſand-hills, which are ſo numerous upon ſea-coaſts, and upon which nothing grows?

Tutor. They ſerve to hinder the boiſterous waves of the ſea from overflowing the low countries. This is worthy your reflection, that ſmall grains of ſand, which you can blow away with your breath, when thrown into a maſs,

a maſs, form ſuch a ſtrong barrier againſt the raging ocean. "Will ye not tremble, ſaith the Lord, at my preſence, who have placed the ſand for the bound of the ſea, by a perpetual decree, that it cannot paſs it, and though the waves thereof toſs themſelves, yet can they not prevail, though they roar, yet cannot they paſs over it."

Pupil. I ſhould wiſh now, if you pleaſe, to turn my thoughts from the land, to that great body of water the ſea. What is there worthy my obſervation?

Tutor. Its extent, its depth, its ſaltneſs, its ebb and flood, and its limits, or boundary.

Pupil. How large is the ſea?

Tutor. It takes up two thirds of the whole earth.

Pupil. Why is it ſo extenſive?

Tutor. For wiſe purpoſes, no doubt. Some philoſophers think it may ſerve as a balance to the land. It is a grand reſervoir of water, from which millions of tuns are raiſed up, by the warmth

warmth of the sun, to form clouds and rain, to supply the whole earth with water.

Pupil. There seems, then, a continual circulation in the material world, as there is in the animal body.

Tutor. You judge right. The rain forms the springs, the springs form the rivers, the rivers run into the sea. The sea furnishes the rising vapours, the vapours form the clouds, and the clouds give the rain. This reciprocal succession began with the creation, and will continue to the end of the world.

Pupil. What am I to understand by the ebb and flood of the sea, or the rising and falling of the tide, as it is commonly called?

Tutor. That this amazing collection of waters rises every six hours, more or less, which is called flood, and after a very short time of rest, falls again, which we call the ebb.

Pupil. What is the cause of this regular movement of the waters, and what is its use?

Tutor. The ebbing and flowing of the sea is supposed to be occasioned by the motion of the earth, and the attraction of the sun and moon, which you will be better able to comprehend when you grow older. This movement of the water preserves it from corruption, which would take place if it was in a state of rest and stagnation. The great usefulness of the sea, for a quick and speedy intercourse with distant nations—for navigation and commerce, is almost inconceivable: The tides are also exceedingly useful for navigation and commerce.

Pupil. Is not the depth of the sea very great?

Tutor. It is not of equal depth—in some places navigators can find no ground with a line of more than seven hundred and eighty fathom.

Pupil. Why is the sea so deep?

Tutor. God, who meted out the heavens with a span, also measured the water in the hollow of his hand—he adjusted it in wise proportion, no doubt

doubt, to the land—and for this reaſon it may be ſo large and deep. By its depth, it contains much more water, and there remains ſo much more dry land.

Pupil. Why is it ſo ſalt?

Tutor. To keep it from freezing, and to yield us ſo valuable an article of life.

Pupil. Does the ſea then produce ſalt?

Tutor. A great quantity of ſalt is taken out of holes dug on the ſea-ſhore, from whence ſea-water is exhaled by the ſun, leaving behind the ſalt which it contained.

Pupil. How beneficial is the ſea for man!

Tutor. But ſurely you have not forgotten the great benefit that man receives from that vaſt inexhauſtible ſtore of fiſh which it contains, great and ſmall, from the whale even to the ſhrimp; for even thoſe which are not good for food, are uſeful for the wants and conveniencies of life. Neither, ſurely,

ſurely, have you forgotten the extenſive general benefits of commercial intercourſe, carried on upon its ſurface, between the moſt diſtant nations of the earth—the ſupport which it is the means of affording to ſhip-builders—and for ſo uſeful a body of the community as ſailors.

Pupil. What confines and keeps the ſea within its proper bounds?

Tutor. The divine ordination.—The ſame all-creating Word which ſaid, "Let there be light, and there was light;" ſaid alſo to the raging ſea, "Hitherto ſhalt thou come, and no further, and here ſhall thy proud waves be ſtayed."

Pupil. What an immenſe quantity of vapour muſt be raiſed out of the ſea to ſupply the ſprings which form ſo many great rivers in every quarter of the world!——But how is water raiſed into the air, which I have heard you ſay is much heavier?

Tutor. This merits your attention. Though water is, as you remember I told

told you, heavier than air, yet it is capable of being made lighter than air, and then it will aſcend. The water which you ſee daily on the kitchen fire would all evaporate in ſteam when boiling; this familiar occurrence may ſerve to give you ſome idea how water may be made to aſcend in the air. Our philoſophers tell us, that a particle of water may be ſo rarified, that it may become ten times as large as it was before; and this you may have ſeen yourſelf, without having obſerved it in this light, in the water balloons which children form with a pipe, which immediately aſcend, being then become lighter than air: This ſhews that air will adhere to and mix with water.

Pupil. But what is the principal cauſe of the aſcenſion of theſe vapours from the ſea?

Tutor. The warmth and heat of the ſun, by which the water is rarified.—That fire is lighter than air, you may ſee from the velocity with which all flames aſcend into the air. *Pupil.*

Pupil. What is your opinion of fire?

Tutor. It is as neceſſary and uſeful as air and water.

Pupil. Where do you acquire it?

Tutor. It lies hid in almoſt every thing, becauſe we have continual need of it—there it remains in a ſtate of reſt—but when it is brought out of its reſting-place, it ſpreads itſelf amongſt fuel, whether of wood or coals. It melts and ſoftens the hardeſt metals, evaporates moiſture, boils and roaſts our meat, and warms our houſes in the cold months of winter. Without fire, having no candles—lamps or torches, we ſhould be without light too, as well as without warmth and heat.

DIALOGUE VI.

OF ANIMALS.

Pupil. I SHOULD now wiſh to know ſomething of the animal creation?

Tutor.

Tutor. God has created several hundred thousand sorts of living creatures. Some live in the water, some on the earth, and some in both, which last we call amphibious; and others are inhabitants of the air—but all are subject to the reason of man.

Pupil. Why are they?

Tutor. That they may be made useful to us; which otherwise they could not be, because of their superior strength.

Pupil. Have animals senses as we have?

Tutor. The four-footed beasts have five, and some of them stronger than ours; the smell in hounds, for instance, and hearing in moles.

Pupil. How are so many millions of creatures supported and preserved?

Tutor. Every day is a table (as it were) provided by God's providence for so many guests. Care is also taken that we cannot annihilate any one species of food which God has created

Pupil. Is there any thing farther to be observed? *Tutor.*

Tutor. Each have their weapons of defence; and they know, when they are ſick, what is medicinal. They know the element in which they are to live, and their own proper food; they know how to build their habitations, (of this kind the beavers ſeem to approach the neareſt to human ſagacity) they are able to diſtinguiſh their enemies, and to underſtand each other.

Pupil. If they underſtand each other, have they then a language peculiar to themſelves?

Tutor. They have: This appears from the different ſounds lions, bears, wolves, horſes, &c. &c. make in different ſituations.

Pupil. Have they paſſions like ours?

Tutor. Yes: they have affection, joy, grief, ſympathy; they have manifeſtly anger and reſentment, jealouſy, &c. It may here alſo be obſerved, that the nature or diſpoſition of each remains the ſame; the horſe is ſpirited and full of fire, the lamb mild and gentle,

gentle, the hare timid, and the dog watchful and faithful to his master.

Pupil. O how much are we indebted to our kind Creator, who has made all these subservient to us!

Tutor. And our thankfulness should rise still higher, when we reflect, that these living creatures are not only designed for our use, but for our food also, at least the greatest part of them. This consideration should induce us to treat the brute species with lenity—cruelty to them is ingratitude to God who formed them. On the contrary, we ought to take all proper care of them, and give them whatever is necessary for their support: And never injure them by too severe labour and fatigue. "Thou shalt not muzzle the ox, when he treadeth out the corn." And again, "A righteous man regardeth the life of his beast."

Pupil. But of what use are the wild beasts of the forest?

Tutor. They are all serviceable in

ſome degree; ſome for food, others for clothing. The ravenous beaſts of prey may prevent the too great increaſe of other noxious animals; the wild beaſts of the foreſts may alſo prevent man from retiring into deſerts, and baniſhing himſelf from ſociety and from uſefulneſs. They ſerve alſo to ſhew us the greatneſs and variety of God's works, and the fine gradation there is from the ſmalleſt of the animal tribe, up to the lion, the elephant, and the rhinoceros; and to ſhew us that providence extends its care even to the inhabitants of the wilderneſs. "Thou makeſt darkneſs, and it is night, wherein all the beaſts of the foreſt do creep forth. The young lions roar after their pray, and ſeek their meat from God."

DIALOGUE VII.

OF BIRDS.

Pupil. WILL you now be ſo kind as to ſpeak of the feathered tribe? I am delighted

delighted with the ſweet notes of birds.

Tutor. To enjoy this pleaſure undiſturbed, you muſt riſe early in the ſummer ſeaſon.

Pupil. I have been taught by my parents to riſe early to preſerve my health; and I find it contributes both to my health and pleaſure.

Tutor. I hope then you will always riſe with the lark: an early hour is the beſt alſo for reading, for meditation and ſtudy. But to return to our ſubject. The production and the ſtructure or formation of a bird, calls for your attention. Obſerve how he acquires his exiſtence. Out of that matter or ſubſtance with which an egg is filled; and this effected after it has been impregnated only by a brooding heat. The ſtructure of birds is alſo curious, and a proof of great ſkill and wiſdom. How well adapted is their form for flying! The ſubſtance of their bones is much thinner than that of land animals, that they may be lighter and better able to mount in the air.

And

And that the thinneſs of the bones ſhould not render them weaker, the ſubſtance of the bone itſelf is ſtronger and harder.

With their pointed beak they can more eaſily cut the air: but what is moſt obſervable in birds, is, their being capable of flying in the air, and ſome of them with an amazing rapidity, for which purpoſe their wings are curiouſly conſtructed. But the flight of birds is what we ſee almoſt every hour, and therefore, like moſt other things that are common, eſcapes our attention.

Pupil. Our motion upon the earth from one place to another, with ſo much eaſe, and this too almoſt without our thinking of it, might well excite our admiration at the wiſdom of our Creator; but the motion of birds in the air is ſtill more ſurpriſing; and I long to know ſomething farther of the ſtructure of their wings, and in what manner they move and ſuſpend themſelves in the air.

Tutor.

Tutor. I am glad to find in you an increasing desire of knowledge; but this, with many other things which we have only just touched upon, you will better be able to comprehend a few years hence.

Pupil. I thank you, but will you tell me more now?

Tutor. You were just observing that you are much pleased with the singing of birds: And does it not strike you with admiration too, that the tender throats of such small creatures, and those of the male particularly, should be able to form such shrill and variegated notes, while a great ox, or bull, can only bellow and roar. It is observable farther, that as they have to fly through the woods, they are provided with a membrane to protect the eye, which we have not—and also, that their ears are placed more within, and covered with feathers to guard them against the pressing wind.

Pupil. I do not perceive, that birds have any teeth to chew their food?

Tutor. True. But to break their food ſmall, they have beaks as tough as horn, which are very long in thoſe that fiſh under water, ſhorter in thoſe that muſt peel ſeeds, and hard as iron in thoſe of a ſtronger contexture.

Pupil. Do not they ſometimes periſh for want of food?

Tutor. I believe not for want of food, unleſs in ſome extraordinary caſes.—"They ſow not," ſaith our Lord to his diſciples, "neither do they reap, nor gather into barns; yet your heavenly Father feedeth them." And what is worthy your notice here, is, that thoſe birds which lay not up any ſtore for winter, are always ſeaſonably provided for: Not even the ſparrows are forgotten before God. "He giveth to the beaſt his food, and to the young ravens which cry." Thoſe birds which find not their proper food in one country, fly to another: Theſe we call birds of paſſage—ſuch as the ſtork, the crane, the ſwallow, the woodcock, the turtle, and ſome others,

ers, which leave their own country at ſtated periods, to go to more favourable climates, and return again on the change of the ſeaſon.

Pupil. That is truly amazing.—How can they find their way over different kingdoms and ſeas?

Tutor. Their wiſe and bountiful Creator has given them that knowledge which we call inſtinct. "The ſtork in the heaven knoweth her appointed time, and the turtle, and the crane, and the ſwallow obſerves the time of their coming."

DIALOGUE VIII.

OF FISHES.

Tutor. TO what ſhall we next turn our attention? Suppoſe we now take a view of the inhabitants of the watery world.—What think you of creatures living in an element which would be fatal to us, and which could not live upon the earth as we do? Water is the dwelling-place of millions of fiſhes.

Pupil.

Pupil. How diverſified are the divine works!

Tutor. So exclaims the pſalmiſt, "O Lord, how manifold are thy works! in wiſdom haſt thou made them all. The earth is full of thy riches. So is the great and wide ſea, in which are things creeping innumerable."

The ſtructure of fiſhes is entirely oppoſite to what is proper for the flying of birds. Different means muſt neceſſarily be applied to make birds and fiſhes move upwards and downwards in their different elements. A ſmooth long body, thick before, and gradually diminiſhing in bulk behind, is the beſt formed for ſwimming.—And of this form are fiſhes.

Pupil. How do they breathe?

Tutor. Not as we do; for the air comes in through the mouth, and goes out through the gills.

Pupil. Have they ſenſes?

Tutor. Their noſtrils ſhew they have the uſe of ſmelling. Their feeling, too, is finer than ours, becauſe they ſooner perceive the changes

es of the weather. Neither is their ſenſe of ſight prevented by the water, for which purpoſe their eyes are differently conſtructed from ours.

Pupil. Of what uſe are the ſcales of the fiſhes?

Tutor. To preſerve them from being bruiſed, or cruſhed by the preſſure of the water—and to guard them againſt the cold.

Pupil. How do they dart forward ſo nimbly in the water?

Tutor. By means of their tail, by the motion of which they puſh themſelves forward.

Pupil. Of what uſe are the fins?

Tutor. To keep them in equilibrium, or with their belly downard—to turn on either ſide, or to ſtop their progreſs.

Pupil. By what means do they riſe or deſcend in the water?

Tutor. They are enabled to do this by means of a white air-bladder, which they can dilate or contract at pleaſure.

Pupil. How does that occaſion their aſcent or deſcent? *Tutor.*

Tutor. Becauſe, in the firſt caſe, they are lighter than water—and in the latter, heavier.

Pupil. How are they ſupported?

Tutor. They eat worms, and flies, and plants; and the large fiſh feed upon the ſmaller, of which our bountiful Creator has given ſuch a vaſt increaſe, that the ſpawn of a perch would produce more than twenty-eight thouſand. "And God ſaid, let the waters bring forth abundantly."

Pupil. Are there any fiſh which migrate in the water, as birds of paſſage do in the air, at certain ſeaſons?

Tutor. Yes; ſuch as the ſturgeon, ſalmon, herring, ſmelt, pilchard, and others; ſome of which come from the ſea into our rivers, and others are found in ſhoals, in certain parts of the ocean, and at certain times of the year; to which they are no doubt, led by what we uſually term inſtinct.

Pupil. What a vaſt ſtore of proviſion is here laid up for man!

Tutor. Thus you ſee how good and bountiful

bountiful God is to us—" He has put all things under our feet—all ſheep and oxen ; yea, and the beaſts of the field, the fowls of the air, and the fiſh of the ſea, and whatſoever paſſeth through the paths of the ſea. O Lord ! our Lord ! how excellent is thy name in all the earth !"

DIALOGUE IX.

OF INSECTS.

Tutor. LET us now take a view of the ſmaller part of the living creation. What think you of thoſe called inſects ?

Pupil. I cannot ſay that I ever thought much about them.

Tutor. But we ſhould not overlook any part of God's creatures.

Pupil. Where do inſects live ?

Tutor. Every where. In the air, the earth, the water, in ſtone, in ſhells, in mud, and in ſand.

Pupil.

Pupil. On what do they live?

Tutor. Upon almoſt any thing—upon fleſh, fiſh, flowers, herbs, filth, and dirty ſlime, which is often ſeen upon the water in ſummer.

Pupil. What parts of an inſect are moſt to be admired?

Tutor. Their fine beautiful eyes, their wings, their colour, their offenſive and defenſive weapons, &c. &c. If you look through a microſcope, you will find that what we thought to be duſt on the wings of a butterfly, conſiſts of a number of beautiful feathers, arranged in great order.—The legs alſo of inſects are worthy of peculiar attention. Thoſe of a fly, for inſtance, by which it can walk up a window perpendicularly, or horizontally upon a ceiling.

Pupil. But how can they do that?

Tutor. By means of a glutinous matter, which enables them to keep their hold. But, beſides this, many bodies which appear plain and ſmooth to the naked eye, have a roughneſs, which

which their ſmall and tender feet can catch hold of.

Pupil. How are they propagated?

Tutor. By eggs, which they carefully hide in the moſt ſecure places, in great quantities.

Pupil. Are not many inſects injurious?

Tutor. Some, no doubt, are—the locuſt, caterpillar, and ſome others; but, that theſe may not be too numerous, great multitudes of them are deſtroyed by birds. But even caterpillars, which we deem ſo pernicious, are yet very ſerviceable; and I doubt not, but many other inſects are uſeful for purpoſes of which we are ignorant.

The ſeveral members of this little tribe are (with ſome few exceptions) very induſtrious. From the labour of bees, we receive our honey and our wax; the former being lodged in warm apartments of their own forming.

Pupil. And how can theſe creatures do what man cannot do? How can they make honey?

Tutor. By flying abroad, and collecting together the very fine eſſence of flowers, both of the field and of the garden, which is done by their trunk; with which ſmall tube they ſuck up the delicious ſyrup as nature produces it, and then depoſit it in cells.

Pupil. Do they each know their own cell, and keep to that as their conſtant place of reſidence?

Tutor. Bees are like a well-ordered community. They have a ſovereign bee, to whom they are all under ſubjection. The laws and regulations of this induſtrious tribe are generally ſubmitted to, and punctually obſerved. They all labour for the common good, and mutually aſſiſt each other. In ſhort, man himſelf may from them receive much inſtruction. Their haſtening to their hives in great numbers, is a ſure ſign of rain.

Pupil. Is it not cruel to put to death a whole community, and unjuſt to ſeize the fruits of their labour?

Tutor. There is no injuſtice in appropriating

propriating the fruits of their labour to our uſe, becauſe, by their making more honey than they want, we perceive that a part was deſigned for us. And, with reſpect to putting them to death, why may we not as well put theſe to death, as an ox, or a ſheep? It is the number of the ſlain in one and the ſame moment, all periſhing together, that alarms our feelings: Could we ſee as many cattle ſlaughtered in the field in one day, we ſhould exclaim againſt it as an act of cruelty—but as theſe are killed at ſeparate times, and in different places, it is in that proportion leſs ſenſibly felt. However, there is a method of taking the honey, without deſtroying the bees, and this is certainly the beſt method.

Pupil. But how can they ſubſiſt during the winter, if we deprive them of their honey?

Tutor. We always leave them what is ſufficient, or ſupply them as they are in want. So that what we take,

may

may be conſidered as a kind of ſuperfluity, which they can well ſpare.

Pupil. Are not ants, too, remarkable for their induſtry, regularity, and order?

Tutor. They are a little people, united like the bees; but may rather be termed a commonwealth, than a monarchy. Their ſagacity is very conſpicuous in the various methods they uſe to procure food, and their friendly contrivance to carry it home. The food they ſtore up ſo carefully, is probably for their young, when they firſt come out of the egg, for in the winter they are ſuppoſed to be in a torpid ſtate.

Pupil. I have heard I think, ſomething remarkable concerning caterpillars.

Tutor. Beſides their beautiful form, in their firſt ſtate, after ſome time they change their coat, and become beautiful butterflies.

Pupil. But do not they produce our ſilk?

Tutor. Without doubt: they are

silk-manufacturers. This they make of a gum of which they have in their inside, in a small bag or bladder. In goldsmiths shops you may probably have seen iron plates with holes, through which they draw the gold wire to its proper size. The silk-worm has under her mouth, something resembling such a kind of perforated instrument, thro' which she draws the gum. This supplies the materials, out of which she spins her thread, and, by passing thro' these holes, it receives its form and length.

Pupil. How useful are these insects, which we are apt to despise!

Tutor. More useful, in their humble sphere, than some of the human species themselves. All useless members of society may learn a lesson even from the tribe of insects.

Pupil. Are spiders of any use?

Tutor. Our aversion to spiders arises from their ejecting a poisonous matter, with which they kill their enemies.

mies. But I believe the quantity they can eject, tho, fatal to insects, would not produce to us any great injury. Spiders, however disagreeable to us, are not without their uses—they catch and destroy many flies; the webs which they spread over the trees in summer, in some degree preserve the fruit; and they may be more useful in our houses than we are aware of—they may inhale some noxious qualities of the air, which might otherwise become prejudicial to us. The webs which spiders form, particularly in gardens, are exceedingly curious, and deserve your accurate inspection.

Pupil. How do the field spiders carry their first thread from tree to tree, or across the lanes, as we often see in the summer?

Tutor. Some have thought that the spider must fly, to do this; but she transports herself in this manner*—'She places herself upon the end of

* *Nature display'd.*

of a branch, or ſome other projecting body, and there faſtens her thread; after which ſhe preſſes out more long threads, which ſhe leaves floating in the air. Theſe threads are wafted by the wind from one ſide to another, and are there faſtened by their natural glue; ſhe afterwards draws them to her, to try if they are well fixed, and then they become a bridge, over which the ſpider paſſes and repaſſes at pleaſure. Others are of opinion, that as theſe are often ſeen, when there is no wind to waft them over, that, after having fixed the thread on one ſide, dropping then to the ground, they carry the thread themſelves, and mounting where they want to fix it, there draw and faſten it.

Pupil. I have often wondered how ſnails build their habitations, which they carry about with them.

Tutor. Their carrying their own habitations with them, is ſomewhat ſingular. I am not ſurpriſed that your inquiſitive eye ſhould have ſelected this

this as inviting an accurate inſpection.

Every animal, in nature, has its habitation. The roof under which the ſnail reſides, has two properties, which appear difficult to be united, ſolidity and lightneſs; without which its inhabitant could neither be protected from injury, nor transfer its habitation from place to place. At the approach of winter, ſhe retires into ſome cavity and her body diſtils a certain glutinous matter which cloſes up the aperture of the ſhell. Thus ſhrouded up ſhe paſſes the cold ſeaſon in ſafety. When the ſpring ſeaſon commences, ſhe opens her door, and ranges at her pleaſure.

Pupil. I think I remember to have heard ſomething remarkable concerning the eyes of ſnails.

Tutor. Probably you may, for they are uncommonly curious and ſingular. As they creep upon the ground, and have the weight of their apartment upon them, if their eyes were not ſomewhat elevated, they could not

not well distinguish what they were to avoid, nor what they might approach. To prevent this inconvenience, they are furnished with what we may term telescopic eyes. Those which children call the snail's horns, are four tubes, with a glass at the extremity of each; or, if you will, you may call them four optic nerves, which end in as many beautiful eyes. These she can elevate, and turn about in every direction, and lengthen or contract them, as we do the telescope.

Pupil. I do not perceive that they have any feet.

Tutor. To shew the diversity of the divine works, they have two large muscular skins, which they can lengthen and contract at pleasure, by which means they move and draw their castle, which rests upon their backs. And, to prevent accidents, they are provided with a viscous humour, which by its cohesion, secures them from falling, and renders them impenetrable to moisture, by an oily matter

matter with which they close all the pores of the skin.

Pupil. And, now please to inform me how their shell is made.

Tutor. The snail has a very small shell, rather soft when she leaves the egg: This shell forms the basis of a second, which is gradually increasing. The first is the centre of the other, and the whole is formed by adding new circles to the first shell. And as her body can only be extended towards the aperture, this must consequently be the part which receives the fresh accessions. The materials from which the shell is made, are lodged in the body of the animal, and formed by a viscous fluid, and sandy particles of exquisite fineness, which thicken into a consistence round the extremity of the shell, and become incrustated. This will also give you some idea how the shells of all sorts of fishes are formed.

Pupil. I thank you for the trouble you take with me, in giving me these instructions, which so much enlarge my

my ideas of the wisdom, power and goodness of the Creator.

DIALOGUE X.

OF PLANTS, AND THEIR PROPERTIES.

Tutor. OUR indulgent Creator, who formed this earth for us to live upon, formed it also to produce what is necessary for our support and pleasure; such as plants, trees and flowers, in very great variety. From the beginning of the world, these have continued in regular succession, without any new creation in any one production of the earth, unto the present day. Neither in living creatures is there any new creation. Men, beasts, birds, fishes, insects, none of them are lost. And what merits your particular notice, is, that so many thousands of plants, growing in the same soil, and enjoying the same sun, and the same rain, should differ so much in taste and smell from each other. How conspicuous

ſpicuous is the divine wiſdom and goodneſs, in providing for us ſuch a rich variety!

Pupil. The earth, the air, and the ſea, I perceive, is full of his goodneſs. But why are the plants all of a green hue?

Tutor. Green is more pleaſing and beneficial to the eye, than any other colour whatever.

Pupil. From what are the plants produced?

Tutor. From ſeed, produced by the plants, each produces its like, which lie neatly encloſed in huſks, for their preſervation. And of theſe there are above twenty thouſand different kinds. Seeds ſhoot their root downward, and the ſtalk, or trunk upward.

Pupil. And how do they grow?

Tutor. By the air, rain, warmth and nouriſhment which they imbibe from the moiſture of the ground, in the ſmall fibres of their roots.

Pupil. Of what uſe is the bark, and the leaves of trees?

Tutor.

Tutor. The bark to preſerve them from external violence, and to nouriſh them by the riſing of the ſap, the leaves, to catch and receive the dew and rain.

Pupil. I think you told me once, that there are not two leaves alike, even on one tree.

Tutor. True; two things exactly alike, are not to be found in the whole world. So various are the works of God. The uppermoſt ſurface of the leaves is ſmooth or varniſhed, that the water may not lodge upon them, which would ſoon make them decay. The undermoſt is without that varniſh, that it may imbibe the dew.

Pupil. Of what uſe are thoſe trees, which bear no fruit?

Tutor. Our foreſt not only afford us a beautiful and variegated proſpect, and an agreeable ſhade; but alſo timber for building, maſts for our ſhips, materials for huſbandry, for furniture, and for the various exerciſes of art, and for fuel.—Of theſe, the hickory,

the oak, the aſh, the pine, the poplar, the ſycamore, the beech, the elder, the walnut, the elm, the willow, the box, the mahogany, the live-oak, and the cedar, are the moſt valuable.

Pupil. I was not before ſo ſenſible of the value of trees in general: Thoſe which I valued moſt, were fruit-trees.

Tutor. And even of theſe, how plentifully has our heavenly Father provided, and in what variety! Trees, which bear apples, cherries, pears, peaches, plumbs, apricots, grapes, oranges, lemons, gooſe-berries, currants, raſberries, pine-apples, nuts, mulberries, quinces, &c. Nor muſt we omit to mention here the humble ſtrawberry. What an indulgent Parent! who hath not only made ſuch rich proviſion for our neceſſities and bare ſupport, but even for our enjoyment and pleaſure, to pleaſe our palate, to refreſh, to cool and allay our thirſt, during the parching heat of ſummer.—Neither muſt we here forget the variety of garden plants and herbs, which God hath

hath provided for our table—the ſpinnage, the cabbage, the ſprouts, the cauliflower, the artichoke, and the aſparagus—And the uſeful roots—the raddiſh, the onion, the turnip, the carrot, and the potato, with many others.

Pupil. I hope I ſhall always love and eſteem ſo kind and ſo gracious a benefactor; and prove my gratitude ſincere, by my unceaſing attention to conform to his divine will, in every thing.

Tutor. This, I do aſſure you, would rejoice my heart, and the hearts of your affectionate parents.—God grant this may be the happy fruit of theſe inſtructions, not only to you, my dear pupil, but to all who may peruſe them.

Pupil. How is fruit produced?

Tutor. In many plants, the fruit proceeds from the ſame part where you ſee the bloſſom has been. But in the ſmall nut, and the cheſnut-trees—in the Turkiſh and Indian corn, the

the fruit comes where the bloſſom has never been; otherwiſe almoſt all fruits are preceded by bloſſom. But the fig comes to perfection without a flower. And in melons, cucumbers, and ſome others, the fruit is ſeen before the flower.

Pupil. How is the fruit preſerved?

Tutor. By the ſhell, or rind. But it is not the ſame in all. In melons and cucumbers, this is very thick, in others very thin.

Thoſe lying near the ground, would otherwiſe be deſtroyed by inſects.—And grapes could not be eaſily preſſed, if their ſkin or rind was like that of the melon. The peach and the plumb, are appointed for our refreſhment, at the cloſe of the violent heats. Their uſe being limited to a ſhort period, their clothing is adjuſted accordingly, and a thin ſkin is ſufficient.—The apple and the pear, which are deſigned to be continued through the winter, have a covering of a more compact contexture. For which reaſon,

ſon, cheſnuts, and other ſpecies of nuts, are preſerved in a ſtill more ſecure manner. The cheſnut, in its infant ſtate, is ſecured from the birds, as is the gooſe-berry by prickles.—And the walnut, which, in its immature ſtate, furniſhes our tables with ſuch a fine pickle, would probably be deſtroyed in its infancy, if it was not ſecured by the bitterneſs of its rind.

Pupil. And where are to be found the ſeeds of theſe fruits?

Tutor. As they are very precious for the propagating of their reſpective ſpecies, they are placed within the fruit, in a ſafe repoſitory—ſome in a hard ſtone, others with glazed walls. One of the moſt curious which I have ſeen, is the coffia.

Pupil. How can we beſt judge when fruit is ripe?

Tutor. By the colour, and by the fading of the ſtalk, or when, with a gentle touch, they are looſened from the branch.

DIALOGUE XI.

OF FLOWERS.

Tutor. SUPPOSE we now walk into the flower-garden.—See, what a beautiful ſight! What variegated colours! How pleaſing to the eye!—How fragrant to the ſmell!—Heavenly Father! are theſe the gifts of thy bounty to man? All thoſe plants of the earth (whether productive of fruits or flowers) which appear more provided for our pleaſure than for our neceſſity, are proofs that God is abundantly gracious.

Pupil. You encourage me to truſt in the divine goodneſs.—May I now aſk you what are thoſe properties of flowers, which I ought more particularly to notice?

Tutor. Flowers are diſtinguiſhable, by their beautiful colours, their variety, and by their fragrant ſmell. Nor are they merely ornamental, but moſt of them ſerviceable.—It may juſtly fill you with admiration, that from green

green plants, ſo many fragrant flowers ſhould ſpring up—that from a bulb of no very pleaſing form, ſhould ariſe ſuch variegated tulips—or the beautiful ranunculus, from a dirty little claw; this, unleſs we had ſeen, we could never have believed.

Pupil. Of what ſort are their colours?

Tutor. Of all ſorts. Sky-blue, ſea-green, common-green, olive-green, purple, yellow, orange, crimſon, red, violet, roſe-colour, mouſe-colour, aſh-grey, and ſilver colour, &c. &c.

Pupil. What have you to obſerve concerning their ſmell?

Tutor. This conſiſts in the fragrance ariſing from the juices, and from volatile parts, which are continually exhaling out of the ſmall evaporating tubes of the flowers, or from the leaves.

Pupil. Which excel moſt in fragrance?

Tutor. Violets, woodbines, auriculas,

ulas, July-flowers, roſes, lillies, &c. the very mention of which almoſt renews their fragrance. Some wild heath flowers, and field flowers, have alſo a peculiar flavour.

Pupil. You have ſaid that they are not only ornamental, but uſeful?

Tutor. Yes, flowers cheer the drooping, and refreſh the wearied ſpirits: they yield us fruits and ſeed; and particularly honey, oil and wax, ſnuff, perfume, paint, and medicines.

Pupil. But ſome flowers have a diſagreeable ſmell.

Tutor. They may thereby poſſibly correct or abſorb the noxious vapours; they may ſerve for food, to ſome animals and inſects, or they may have ſome medicinal virtues. With all our boaſted knowledge, we have not diſcovered all the excellent uſes either of herbs or flowers.

Pupil. What a kind and indulgent Providence!

Tutor. And what a ſtrong argument to truſt in divine providence, has our bleſſed

bleſſed Saviour drawn from even that part of nature we are now contemplating, 'And why take ye thought for raiment? Conſider the lillies of the field, how they grow; they toil not, neither do they ſpin; and yet I ſay unto you, that Solomon in all his glory, was not arrayed like one of theſe. Wherefore, if God ſo clothe the graſs of the field, which to-day is, and to-morrow is caſt into the oven, ſhall he not much more clothe you, O ye of little faith?'

DIALOGUE XII.

OF SEEDS.

Pupil. WHAT means has the all-wiſe Creator uſed for the preſervation and increaſe of plants and flowers?

Tutor. For this purpoſe, God has ordained the ſeed, which, however ſmall (and ſome ſcarcely viſible) yet deſerve to be ranked amonſt the moſt ſkilful works of God. Each plant produces a great quantity of ſeed, which

which preſerve it to future generations.

Pupil. Where are theſe ſeeds to be found?

Tutor. In ſome, in the top of the plant; in others, in the middle of it; and, again, in ſome, between the leaves or under them. They are found in little huſks, or in convenient partitions, ſeparated from each other by a thin ſkin; others ſtand in order together, as in the ſun-flower. Does it not appear to you aſtoniſhing, that ſuch great plants as trees ſhould ariſe from ſuch ſmall ſeeds?

Pupil. It does indeed; and yet if they were larger, they might injure us by the fall. I remember very well the fable of the acorn and the philoſopher. But does one plant, or tree, produce many ſeeds in one ſeaſon?

Tutor. This is very various; in ſome more, in others leſs. A tobacco plant has been known to produce more than forty thouſand ſeeds, an elm tree more than three hundred thouſand annually.

Pupil. And why ſuch an amazing number?

Tutor.

Tutor. Hereby is a great provision made for the fowls of the air. If they were once all consumed, how could we ever recover them again? Which might easily be the case, if there was not such a great increase. Admire this display of divine power, wisdom and goodness; for without such a provision, the birds must half of them perish. Food in that form, and small compass, can more easily be preserved for their support in winter.

Pupil. How do the seeds come out of the pod?

Tutor. In dry weather, when the pods are withered, they open, and the seeds being dry, they easily fall out upon the ground; and these seeds which are not gathered, sink into the earth with the rain.

Pupil. What becomes of the lighter seeds?

Tutor. They are carried about by the wind, and fall when the wind ceases. For this reason, we see plants upon high old walls; because seeds, falling between

between the crevices of the ſtones, often grow. Birds, alſo, in carrying them, may frequently let them fall in their flight. And, beſides this, nature has furniſhed ſeveral of them with ſoft down, which ſerves as wings to convey them through the air to diſtant places.

Pupil. How long will ſeeds continue?

Tutor. Several years; for ſometimes wet ſeaſons prevent the ſeeds being gathered in, and then recourſe muſt be had to the old ſtock.

Pupil. What makes the ſeeds ſprout forth?

Tutor. Moiſture and warmth, which cauſe a fermentation in the meal, or flour of the ſeed, and give the firſt nouriſhment of life to the ſprout therein incloſed. It no ſooner makes its appearance, than it caſts off its huſk, ſends forth a root, and, receiving more nutrition, it ſhoots up, and gradually riſes to perfection.

Pupil. Do ſeeds anſwer any other purpoſe than thoſe which you have already mentioned? *Tutor.*

Tutor. Yes, some seeds are food for man, and for beasts, as well as for birds. They also yield us oil for painting, and provide us with what is of a medicinal nature. From which we learn, that the smallest things are not to be overlooked or despised, being often found exceedingly beneficial.

DIALOGUE XIII.

OF THE SEASONS—OF GRASS, CORN, &c.

Pupil. WHAT opinion am I to form of the changing seasons?

Tutor. That they are so ordained by God, for wise purposes; to promote vegetation, and make men industrious.

Pupil. Should not we be better without the winter season?

Tutor. By no means; even the winter (the severity of which we feel so sensibly) lays the foundation for our future sustenance, by making the earth more productive; and frosty weather contributes to our health. The

earth must have rest too, as well as man. So that we ought to be thankful for the winter's cold, as well as for the summer's heat. And, besides this, when it is winter with us, in the northern part of the globe, it is summer with the inhabitants of the southern hemisphere: And surely we are not so selfish, as to wish to monopolise all the favours of heaven to ourselves.

Pupil. But spring, I am delighted with the spring.

Tutor. Have you considered why the spring so much delights you? It is partly owing to the winter you have so lately passed through. Your having just then emerged out of that rigorous season, gives you a more lively perception of the happy change; as a severe fit of sickness gives additional enjoyment to restored health. The spring yields you peculiar pleasure, as a time of promise. What appeared dead before, begins then to assume new life; and presents you with the pleasing hope of the succeeding fruit-

ful

ful seasons. The prospect of the summer, which, in process of time, raises every thing to its full maturity; and the prospect of harvest, which not only rewards the toil of the husbandman, and furnisheth us with provision for the time present; but also sets before us our winter store, that fear of future want may not distress us.

Pupil. Which are the most useful products of the earth?

Tutor. Grass and corn. God causeth grass to grow for the cattle, and bread, which strengtheneth the heart of man.

Pupil. What is there particularly observable in the grass?

Tutor. That it grows spontaneously, without the aid of man, and affords sufficient food for the beasts of the field; and covers the upper surface of the earth as with a carpet, very pleasing to the eye.

Pupil. But what provision is there for the cattle in the winter?

Tutor. Part of the grass is mown and dried, which is then, you know, called

called hay, and ſerves for their winter food. The graſs is, in ſome ſeaſons, cut a ſecond time; or it remains in the field, for the cattle's ſubſiſtance after harveſt.

Pupil. Which are our principal grains?

Tutor. Wheat, rye, barley, oats, Indian-corn, &c.

Pupil. Of what uſe are the long ſtalks?

Tutor. That the ears may not eaſily be beat upon the moiſt ground. They furniſh the huſbandman alſo with ſtraw, for various purpoſes.

Pupil. For what purpoſe are the ſtalks ſo ſmooth?

Tutor. That the rain may eaſily run off and not rot them.

Pupil. Why have the ſtalks knots and ſhoots, or blades?

Tutor. That they may not be broken in the open fields, by the violence of the winds.

Pupil: Why are they thus pointed and flexible, or waving?

Tutor. The birds would otherwiſe ſit upon them at their eaſe, and pick out the

the grain, and that too, before it was ripe.

Pupil. For what reaſon do they ſow wheat and rye before the winter?

Tutor. That they may have time for growth. The blade appears time enough before the winter, to ſtand againſt the wind and weather: The valuable ear does not then expoſe itſelf to the violent ſeaſon, but waits for warmer weather, and then riſes to perfection.

Pupil. How do the young plants endure the bleak weather.

Tutor. They are richly ſurrounded with blades, like thoſe of graſs, which fall off in the warm weather, and then the plant feeds and flouriſhes.

Pupil. How is it with the grain?

Tutor. The kernels of the grain are ſecurely lodged in ſtrong huſks, or chaff, that the ſun (after the corn ſhoots out in the ear) ſhould not ſcorch and ſhrivel it, or the rain and dew cauſe it to rot.

Pupil. And what further?

Tutor. Alſo, that in time of harveſt, the grain may not be ſhook out and loſt, as the huſbandman is bringing it into the granary.

Pupil. How do the ears of corn grow, and how do they ripen ?

Tutor. When the dew and rain have made them ſwell, the enlivening ſun dries them by degrees through the whole day. By this means they become fully ripe, and eſpecially when, after reaping, the ſheaves ſtand ſome time in the field.

Pupil. And what is the produce ?

Tutor. We have never ſuch abundance as to render it of little value ; nor ſuch a ſcarcity, that men and cattle periſh for want of it. A demonſtrative proof of a divine providence.

Pupil. But ſuppoſe there is a failure in the crop ?

Tutor. When that happens in one place, other countries are generally able to ſupply the deficiency, which has lately been the caſe in France ; a great ſcarcity prevailing there, whilſt in other nations there was a very plentiful harveſt.

Pupil. What is the fruitfulneſs, or product of each ſtalk ?

Tuutor. The produce is almoſt incredible.

credible. I have been informed, that from one grain of rye, has risen a stalk with seventy-three ears, which yielded, in the whole, three hundred and thirty-seven grains.

Pupil. Almost incredible indeed! But this, I suppose, does not often happen.

Tutor. Their different produce depends much upon the nature of the soil, upon good husbandry, the nature of the seed, and the manner of sowing it.

Pupil. In what other respects, do we see the wisdom and goodness of God in the grain?

Tutor. That it can be preserved in granaries, and continue good for some years of bad harvest. Many other fruits of the earth cannot be preserved one year, and some not one month, and others not one day, after they are fully ripe. Neither is there any herb or plant of the field, which affords us such a wholesome nourishing food. With bread we are never satiated. It is justly called the *staff of life.* And yet how insensible are we of its value!

ue! how little thankful for bread! O may we never incenſe the Almighty, by our ingratitude, to teach us the worth of it, by withholding from us the fruits of harveſt!

Pupil. Of what uſe is barely?

Tutor. Of this malt is made, from which we brew ale, beer, and alſo porter, a nouriſhing ſtrengthening liquor, eſpecially for the labouring part of mankind.

Pupil. What uſe is made of oats?

Tutor. In ſome countries, particularly in the northern parts of Great-Britain, the common people make a wholeſome bread of this grain. But it is generally given to cattle, particularly to horſes, without being ground into meal.

Pupil. Which are the moſt uſeful plants, of thoſe which are not deſigned for food?

Tutor. Flax and hemp. The former, which the Dutch, in particular, cultivate with great care, is very profitable to the farmer, and uſeful to the world at large.

Pupil. In what reſpect?

Tutor.

Tutor. The fineſt of our linnen is made of flax. It alſo yields oil. And when that fine linnen is much worn, do you think that it is of any farther ſervice?

Pupil. I have heard that fine rags are a very acceptable preſent for hoſpitals.

Tutor. So they are; but would you think that we make our fineſt writing paper of ſuch rags?

Pupil. Make paper of rags! How is that done?

Tutor. When ground ſmall, they make of it a pulp, or paſte, with water, and glue, and pour it into flat moulds, from which we receive one of the moſt uſeful articles of buſineſs. The coarſer paper is made of coarſer rags.

Pupil. That is a curious manufacture indeed, which I ſhould wiſh to ſee.

Tutor. In our next walk, we will ſtep into the paper-mill, and ſhew you the whole proceſs.

Pupil. And what uſe is made of hemp?

Tutor. Of this they make the coarſeſt of our clothes, for ſails, ſacks, &c. and

and of this, also, is made our ropes and cables for ships.

Pupil. The farther you proceed, the more am I amazed at the very ample store of good things, which God hath provided to supply the manifold wants and necessities of mankind.

Tutor. The whole world is a store-house, or grand magazine, furnished with every article that we have occasion for.

'O Lord, how manifold are thy works! The earth is full of thy riches.'

CONCLUDING DIALOGUE.

OF THE PRODUCE OF OTHER COUNTRIES, AND THEIR USE IN MERCHANDISE.

Pupil. WHAT advantage have we from the produce of the other parts of the world?

Tutor. As every land has its own particular produce, by means of navigation one country partakes of the produce of another; and thousands gain their livelihood by ploughing the ocean, as the farmers by ploughing the earth.—I will mention to you here, some of the principal articles of merchandise, the production of the four quarters of the world, which, as a person of liberal education, it is proper for you to know, and as it may probably be of service to you in future life.

Pupil.

Pupil. You will oblige me.

Tutor. The exports of *South-America* (by the way of Spain) are, gold, silver, quickſilver, Peruvian bark, and balſam of Peru—Of *Surinam*, cocoa, cotton, and coffee. Of the *Weſt-Indies*, rum, ſugar, coffee, cotton, and indigo. Of the *Eaſt-Indies*, cinnamon, cloves, nutmegs and pepper, tea, china, japan-ware, and ſilks. Of *Africa*, gold-duſt, ivory, olives, palm-wine, ſaltpetre, leather, gums and drugs. From the Levant, cotton, raw-ſilk, rhubarb and oil. Of *Spain*, *Portugal*, *and France*, wines, oranges, lemons, figs, prunes, raiſins and cheſnuts. Fine wool is alſo exported from Spain, and the ſteel of Biſcay and of new Caſtile, is judged to be the beſt in Europe. The *Madeira* and *Canary Iſlands*, are alſo well known for their excellent wines, which the hotteſt weather, ſo far from impairing, greatly mellows and improves. Of *Great-Britain*, wool and iron (manufactured) tin, lead, coals, ale and porter. Of *Ireland*, butter, ſalted meat, and manufactured flax, well known by the name of Iriſh linen. Of *Norway*, *Sweden*, and *Denmark*, maſts, oak-planks, fir-timber, ſtock-fiſh, copper, iron, furs, ſkins, pitch and tar. Of *Germany*, rheniſh wine and hock, foreſt timber, and wood for fuel: and the juniper-berry uſed in the making of geneva, the beſt of which is made in Holland. Of *Holland*, flax, hemp, madder, butter and cheeſe. Of *Ruſſia*, hemp, flax, turpentine, pitch, tar, furs, hides and tallow.

Pupil. And what is the chief produce of the United States, for exports?

Tutor. Rice, tobacco, indigo, pig and bar iron, wheat, flour, rye, Indian corn, beef, pork, fiſh, butter, bees wax, pot and pearl aſhes, flax-ſeed, tar, turpentine, pitch, roſin, ſtaves, and lumber. And there is alſo exported from the northern States,

States to the Weſt-Indies, annually, a conſiderable number of horſes, cows, oxen, and ſheep.

Pupil. You have very juſtly ſaid, that the whole world is a grand ſtorehouſe for man. How thankful ought we to be, that though there are ſo many millions of inhabitants on the earth, yet enough is provided for all, and in ſuch abundance too, as totally to baniſh the diſtreſſing apprehenſion of want.

Tutor. Your reflection pleaſes me, as it ſhews you have not been inattentive to my inſtructions. You alſo perceive the great benefits of commerce, by which we obtain the productions of the moſt remote parts of the globe; ſo that not only our own country, but the whole earth, contributes to the ſupply of our neceſſities, convenience, and pleaſure. The natives of one country, not only labour for themſelves, but for other countries, and others again for them; and by theſe united efforts, accompanied with a divine never-ceaſing co-operation, the whole world is ſupported. I have now, my dear pupil, drawn your attention to the principal parts of nature, as far as your young mind is capable of comprehending them. I hope this ſlight ſketch will excite you, with your riſing years, to purſue theſe inquiries, to enlarge your knowledge of the glorious works of nature, and thereby engage you to love the God of nature, to ſerve him, and to magnify his name.

"Aſk now the beaſts, and they ſhall teach thee, and the fowls of the air, and they ſhall tell thee; or ſpeak to the earth, and it ſhall teach thee, and the fiſhes of the ſea ſhall declare unto thee, Who knoweth not, in all theſe, that the hand of the Lord hath wrought this?"

FINIS.